

SOIL SURVEY OF ASHE COUNTY, NORTH CAROLINA.

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DESCRIPTION OF THE AREA.

Ashe County is situated in the extreme northwestern corner of North Carolina. It is bounded on the east by Alleghany and Wilkes Counties, on the south by Wilkes and Watauga Counties, on the west

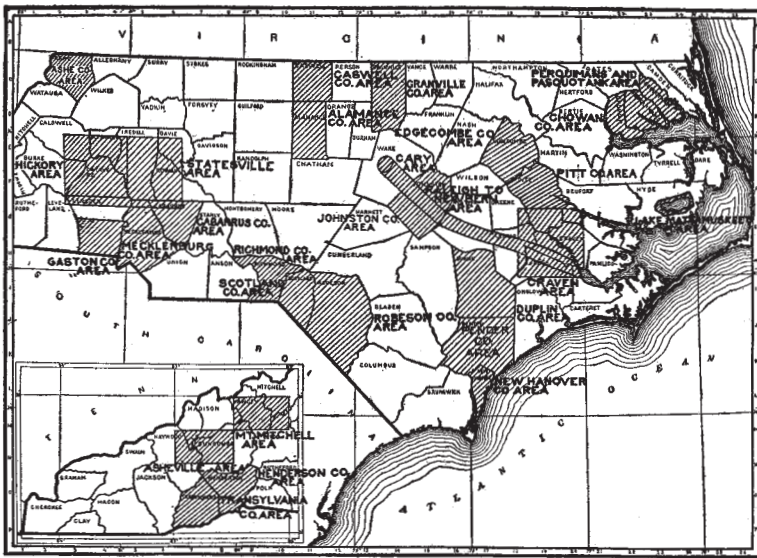


FIG. 6.—Sketch map showing areas surveyed in North Carolina.

by the Tennessee State line, and on the north by the Virginia line. In outline the county is an irregular pentagon. Its maximum length from north to south is $23\frac{1}{2}$ miles, and its greatest width is 27 miles. The area of the county is 273,280 acres, or 427 square miles.

Ashe County lies between the crest of the Blue Ridge Mountains on the southeast and that of the Stone Mountains on the west. It is included within that division of the Appalachian region known as the

Blue Ridge belt. The topography is characterized by numerous high mountains with steep slopes, lower mountains with gentle slopes, having locally the character of hills, and smooth rolling and gently rolling country between the mountains (Pl. I, figs. 1 and 2). The highest elevation is that attained by Peak Mountain, which has an altitude of 5,195 feet. Black Mountain, Nigger Mountain, Phoenix Mountain, Bluff Mountain, and Three Top Mountain are nearly as high. The average elevation of the county is between 3,000 and 3,500 feet. The summits of the largest mountains constitute the least broken upland areas. The intermountain country is hilly to rolling and intersected by many streams. The larger waterways are fringed with narrow strips of flat bottom lands. The mountain sides are generally too steeply sloping for plowing and suited only to hand-hoed crops, fruit, and forestry. The gentle slopes and relatively smooth intermountain country, however, comprise a large total area which can be safely cultivated.

The North Fork and South Fork of New River form two drainage basins which traverse Ashe County in a northeast-southwest direction, and are separated by a watershed extending irregularly across the county from Old Field Bald Mountain northeastward to the confluence of the forks.

The country north of the northern drainage basin is drained by numerous streams flowing south or southeast into the North Fork of New River or into New River, including Grassy, Helton, Silas, Piney, Horse, Stag, Mill, Copeland, Rich Hill, Big Laurel, Roundabout, Rock, and Brush Fork Creeks. The southern part of this basin is drained by streams flowing north into the North Fork, including Long Shore Branch, Phoenix, Buffalo, and Three Top Creeks, and Hoskin Fork.

The drainage of the county north of the southern drainage basin passes into the South Fork through Nathans, Dog, Naked, Beaver, Old Field, Rocky Shoal Branch, Mill, Little, Elk, and other creeks. The county south of the southern basin drains north or northwest into the South Fork through Mulberry, Peak, Roan, Bear, Obid, Pine Swamp, Cranberry, and other creeks.

The streams having their source near the drainage divide are generally short and their descent to the main drainage ways is rapid.

Ashe County was formed from a part of Wilkes County in 1799. In 1849 a part of the original area was cut off in forming Watauga County, and in 1859 another part was separated and included with Alleghany County. The area now embraced by Ashe County was first settled in 1775, mainly by immigrants from Virginia, Maryland, Pennsylvania, New York, and New England.

The census of 1910 gives the population of the county as 19,074, in which whites predominate. The county embraces a great diversity of soils capable under the best methods of soil management of supporting many times the present population.

Jefferson, the county seat and only incorporated town, with a population of about 200, is situated nearly in the center of the county. A number of business enterprises are located here. A large plant for the extraction of tannic acid from woods is located at Hemlock, in the northwestern part of the county. There are many other post offices and villages with locally important business interests.

At present no railroads traverse this section, though a line known as the Virginia & Carolina Railroad has been projected through the county and a right of way purchased. The nearest railroad stations are Troutdale, Va., 28 miles from Jefferson; Mountain City, Tenn., about the same distance from Jefferson; and North Wilkesboro, N. C., 32 miles from Jefferson. The lumber products manufactured in the county are hauled to these railroad points. The county abounds in mineral resources, which are undeveloped because of lack of transportation facilities.

The public roads are in poor condition. The State road, from North Wilkesboro to Jefferson, which enters the county about $1\frac{1}{2}$ miles east of Glendale Spring, probably represents the best section of road found in the county.

CLIMATE.

There is no Weather Bureau station in Ashe County, and the nearest station outside of the county is at Linville, 55 miles southwest from Jefferson. The figures given in the table below have been compiled from the records of this station, which probably represent with a fair degree of accuracy the climatic conditions in Ashe County.

The table shows an abundant rainfall well distributed throughout the year. There is usually a snowfall of about 25 inches each year, and during some years light snowfalls occur at such frequent intervals that the ground is covered to a depth of 2 or 3 inches for a period of three weeks or more.

The average date of the last killing frost in the spring is about April 30, and of the first in the fall about September 30. This gives a growing season of only 150 days. Frequently such crops as corn, sorghum, and pumpkins are hurt by frost.

Owing to the high elevation of Ashe County the summer and fall temperatures are moderate. The most severe weather is experienced during the first two months of the year. Little farm work is done between December and April.

Normal monthly, seasonal, and annual temperature and precipitation at Linville.

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow average depth.
	°F.	°F.	°F.	Inches.	Inches.	Inches.	Inches.
December.....	32	60	- 7	5.7	3.9	3.4	5.4
January.....	31	61	-15	3.4	1.7	4.4	5.4
February.....	30	63	-15	5.3	8.9	0.9	7.0
Winter.....	31			14.4	14.5	8.7	17.8
March.....	40	75	- 4	6.1	3.9	3.7	3.6
April.....	46	79	15	4.6	2.3	3.0	2.0
May.....	58	83	26	3.7	4.2	2.6	0.0
Spring.....	48			14.4	10.4	9.3	5.6
June.....	63	83	33	5.3	7.5	4.6	0.0
July.....	66	89	38	6.1	3.7	9.3	0.0
August.....	65	85	38	5.2	3.0	8.5	0.0
Summer.....	65			16.6	14.2	22.4	0.0
September.....	59	82	27	5.6	7.1	9.6	0.0
October.....	49	74	14	5.3	3.9	18.5	0.2
November.....	40	67	0	3.9	3.6	2.5	1.2
Fall.....	49			14.8	14.6	30.6	1.4
Year.....	48	89	-15	60.2	53.7	71.0	24.8

AGRICULTURE.

From the time of the first settlement of this section of North Carolina stock raising and the growing of hay and grain crops have been the chief agricultural pursuits.

The earliest settlers cleared small areas of upland soils, on which they grew rye and buckwheat, together with some corn and wheat. Cultivation consisted merely of scratching the surface with such implements as could be made at home. When the lands decreased in productiveness they were said to be "worn out," and new farming land was brought under cultivation. Within one or two seasons abandoned fields became covered with grass, mainly bluegrass, and this tended to encourage stock raising. In the early days there was no great demand for stock. Each settler raised enough work stock for his individual use, and cattle, sheep, and hogs were raised only to supply the home demands for beef, mutton, and bacon.

Hides were tanned for making shoes, and wool was spun and woven at home. Flax was grown to some extent for home use. At a later period trading was established with Fayetteville and Wil-

mington, and with Cheraw, S. C., and with this the production of all crops increased and more stock was raised. The first settlers grew only a small amount of corn and wheat. The seasons were said to be too short and too cool for corn, and the soil was not considered well adapted to wheat.

At the beginning of the nineteenth century trade had been opened up between Ashe County and the towns on the watercourses of eastern North Carolina and South Carolina. Subsequently, when the railroads reached Salisbury, Statesville, and Winston-Salem, N. C., and Marion, Va., these points became important markets. Trade with these towns increased until 1890, when the Southern Railway reached North Wilkesboro.

It was not until about 1880 that Ashe County began to make any considerable progress along agricultural lines. A few good plows had been introduced as early as 1872, but these were exceptions. Before this time nearly all the farm implements used in the county were home made, the iron being taken from mines within the county. The cutting and shocking of corn was practiced for the first time in 1882, and it was about the same time that wheat growing over the entire county began. The first grain drills were introduced in 1884. Scarcely any commercial fertilizers were used prior to 1891. The shredding of corn did not begin until 1908.

Although corn was grown only to a small extent in the early history of Ashe County, its production increased rapidly. In 1880, and probably earlier, corn became the leading crop, and it has since held that place. According to the census for 1880, 277,027 bushels of corn were produced in 1879 from 15,616 acres. According to the census of 1900 the acreage in 1899 was 20,907 and the yield was 381,510 bushels. In 1909, the year covered by the census of 1910, only 18,918 acres were planted to corn, and the total yield was 397,716 bushels.

The crop of second importance is hay. In 1879 grass was mowed from 9,439 acres, producing a yield of 7,349 tons of hay. The total hay crop in 1909 was 14,590 tons, from 17,994 acres.

Although very little wheat was grown originally, this has become the crop of third importance. According to the 1910 census 4,357 acres were planted to wheat in 1909, and the total yield was 28,994 bushels.

Rye is still one of the important crops of Ashe County; 2,045 acres were devoted to this crop in 1909, and the yield was 16,243 bushels.

One thousand one hundred and twenty-nine acres were devoted to oats in 1909, and a yield of 10,922 bushels was obtained. Buckwheat has always been an important crop. In 1879, according to the 1880 census, 818 acres were sown in buckwheat, and the total yield was 6,131 bushels. In 1899 a yield of 12,160 bushels was secured from

1,233 acres, while in 1909 a total of 3,856 acres produced 47,698 bushels.

The soils of Ashe County are admirably adapted to the production of apples. This industry would doubtless have been developed many years ago had it not been for lack of transportation facilities for putting the fruit on distant markets. Nearly every farmer has orchards of both summer and winter varieties, which furnish an abundance of fruit for home use and for the local markets. The most popular varieties are the Red June, Yellow Transparent, Early Harvest, Red Astrachan, and Summer Rambo. A great number of winter varieties do exceptionally well. The best shipping varieties common to this county are the York Imperial, Ben Davis, Winesap, Stayman Winesap, Red Limber Twig, Smokehouse, Rome Beauty, and Fall Pippin. Spraying is not generally practiced and little attention is paid to pruning. A few of the best farmers prune and spray the trees with good results, and these practices are receiving more attention than formerly. In 1909 a total fruit yield of 142,523 bushels is reported, including 133,065 bushels of apples.

Sorghum is grown on small patches of land near the houses to supply molasses for home consumption.

Beans for market are produced to some extent throughout the county. In 1909 a total of 622 acres were planted to this crop, and the yield was 2,120 bushels. Garden vegetables are grown for home consumption. The soils of the county are well suited to Irish potatoes, but not enough of this crop is grown to meet local demands. Sweet potatoes are grown to a small extent only, the soils not being particularly suited to this crop. Pumpkins are produced both for table use and for feeding purposes. The gathering of nuts, bark, herbs, and roots is a source of considerable income.

The favorable climate of Ashe County, together with the natural adaptability of the soils to grass crops, has encouraged stock raising, and with the increase in hay and grain production this has become its most important agricultural industry.

The trading in horses, established early in the history of the county with central and eastern North Carolina and South Carolina, has increased and extended to the Valley of Virginia.

The best grades of feeders are sold to traders from Virginia, where they are fed and grazed for several years and subsequently sold as export cattle. Most of the poorer grades of cattle are sold in the Piedmont sections of North Carolina and South Carolina. Sheep are shipped to northern markets. Hogs are raised mainly for home consumption. The value of domestic animals in Ashe County, as reported in the 1910 Census, is \$1,043,338.

For many years no especial attempt was made to raise pure-bred stock, but within recent years blooded horses, cattle, sheep, and hogs

have been introduced. The most desirable draft horses in the county are the Percheron, German Coach, and French Coach breeds. The pure-bred saddle horses are of the Hambletonian strain. There are a number of large Kentucky jacks in the county. The pure-bred beef cattle include the Hereford, Shorthorn, and the Poled Angus breeds. The dairy cattle are nearly all grades. The Southdown, Shropshire, and Hampshire are the principal breeds of sheep. Pure-bred hogs are numerous in the county. The Berkshire is believed to be the most desirable breed for this section.

A large number of turkeys are raised in Ashe County. Most of these are driven to railroad points and shipped to distant markets, while a few are sold locally.

As a result of experience most farmers recognize the adaptation of the different soils to certain crops and the effect of altitude and direction of slope. The crests of the highest mountains are usually occupied by the Clifton stony loam, and these areas are never planted to corn for the reason that the season is too short and too cool. They are well suited to the production of grass and rye, and are usually devoted to these crops.

East-facing, south-facing, west-facing, and north-facing mountain sides are locally known as "east land," "south land," "west land," and "north land," respectively. The north land and west land are planted to wheat and corn only in rare instances, while the east land and south land of all smooth types, except some phases of the Ashe loam, are well suited to these crops. North land and west land are well suited to rye and grass. The soil types occupying the north-facing slopes of Nigger and Phoenix Mountains are considered desirable for all crops. Buckwheat does well on all soils. When favorably situated with reference to direction of slope the Porters clay loam and Talladega clay loam are the best soils of the county for clover and wheat. Grass and corn do best on the Toxaway loam.

With the exception of the Toxaway loam all the soils, regardless of slope or altitude, seem to be about equally well suited to apples. The danger from frost at low altitudes is offset by the danger from freezing or cold, damp winds in areas above the frost line. In some of the mountain coves the air drainage is excellent and here fruit crops rarely or never fail.

The systematic rotation of crops is not generally practiced. Some of the best farmers follow corn with wheat, rye, or oats, and grass and clover mixed. The grain is cut and the grass left for three years. The same rotation is then repeated. In many instances this rotation is varied by sowing buckwheat mixed with grass, after the wheat, rye, or oats has been harvested.

The agricultural methods practiced are not the best. This is largely due to the irregular surface features, and to a less extent to

the absence of transportation facilities and the consequent high cost of bringing heavy agricultural implements and machinery into the country.

The greatest hindrance to farming, however, is due to the fact that the basic principles of agriculture are not well understood. Deep plowing, followed by shallow cultivation, with a view to the conservation of soil moisture is practiced by only a few farmers. The value of leguminous green manuring crops is not generally appreciated. On the greater number of farms the seed beds are poorly prepared. With the present crop systems this, in many instances, is unavoidable. For example, if wheat follows corn it must be sown, in some instances, before the corn is cured sufficiently to be removed from the fields. In cases of this kind the wheat is sown by hand on unbroken ground and scratched in with a bull-tongue or double-shovel plow. However, rotations should be so arranged that each crop might be planted in a well-prepared seed bed.

On mountain sides too steeply sloping to permit the use of farm machinery, the grain is put in with hoes. The better practice is to turn and roll the turf land and drill in the grain. Good yields usually follow this method, especially if fertilizers are used.

Where corn follows corn the usual custom is to break the land to a depth of 4 to 6 inches, lay off the rows, and put in the seed with a hand planter. If turf land is to be planted in corn, the soil is broken in autumn and left to weather until planting time. Then the rows are laid off and the seed put in. Grass is nearly always sown with wheat, rye, oats, or buckwheat.

The use of commercial fertilizers is not well understood. Some of the farmers are careful to buy particular grades for the different crops on different soils, but in most instances little attention is paid to the analysis, and the fertilizer is applied regardless of the crops or the soil. Fertilizers are not extensively used in the county. This is due mainly to the high cost of transportation from distant railroad points.

Most of the labor employed in Ashe County is white. Day laborers are paid 50 or 75 cents, with board. When hired by the month, farm laborers receive \$15 to \$20 and board. According to the census of 1910, \$60,823 was expended for labor in Ashe County in 1909.

The 1910 census reports 2,681 farms operated by owners, and 517 operated by tenants. Various systems of tenancy are in practice. When the landlord furnishes land, one-half of the stock, all wagons and farming implements, and the tenant supplies the labor and one-half of the stock, each takes one-half of all crops. Fertilizer is rarely used on farms let out to tenants, but where used, the tenant furnishes one-half of the fertilizer, while the landlord furnishes all the stock. Under another system the landlord provides the land, teams, and

wagons, breaks the land, and performs certain other labor, while the tenant furnishes the remaining labor and receives one-third of all crops. If fertilizer is used under this system, the landlord furnishes two-thirds of it.

Farms vary in size from 25 to 1,000 acres. The average size of farms in 1909, according to the census of 1910, was 83 acres.

The value of farm lands depends upon a number of factors. Smooth lands near Jefferson and along the best roads sell for \$50 to \$200 an acre. Land with a good turf is held at high prices regardless of location. None of the land of the county can be bought for less than \$20 an acre.

Although agriculture has made considerable progress since 1880, there is still much room for improvement. Deep land breaking followed by shallow cultivation should be more generally practiced. Although stock raising is an important industry in Ashe County, little barnyard manure is produced. More cattle should be wintered and greater quantities of barnyard manure thus made available. Many of the soils are deficient in humus, a condition which should be remedied by turning under nitrogenous manures or green manuring crops. Rye makes an excellent cover crop and has some value as a green manure, but the leguminous crops, such as the clovers, are, of course, to be preferred. Too little attention is paid to the preparation of the seed bed. Before any crops are planted the land should be thoroughly broken and well pulverized. Not enough care is taken in the selection of seeds, especially seed corn and seed wheat. Each farmer should be careful to sow clean wheat and should give greater attention to the germinating properties of all seeds.

SOILS.

Ashe County lies wholly within the Appalachian Mountain and Plateau province. Its soils are largely residual, having been derived from the underlying rocks through processes of weathering. Along the streams there are narrow strips of alluvial soils which are made up of materials washed from the uplands and deposited over the contiguous flood plains.

The residual soils naturally owe their individual characteristics to the character of the parent rocks, and a general discussion of the dominant geological formations of the county will bring out the essential points upon which the soil differentiations are based.

The principal formation of that part of the county north of the North Fork of New River is known as the Cranberry granite.¹ The

¹ See Geological Atlas of the United States, Cranberry folio No. 90. Not all of the area lying north of the North Fork of New River has had its geology worked out. A portion of it is included in the Cranberry granite development, and there is no doubt that the remainder is an extension of the same formation, including smaller areas of other formations.

rocks of this formation consist chiefly of granite, schist, and granitoid gneiss. Numerous dikes or intrusions of diorite, hornblende schist, schistose basalt, and pegmatite are included in this rock belt. The granite is an igneous rock, composed of quartz, orthoclase, and plagioclase feldspar, together with biotite and muscovite mica and hornblende. It varies in texture from fine to coarsely crystalline and in color from light gray or nearly white to dark gray. In places it has a reddish cast.

Two minor formations, the Blowing Rock gneiss and the metarhyolite, and a few narrow strips of a third, the Roan gneiss, occur within the Cranberry granite. The Blowing Rock gneiss consists of two varieties, one uniformly fine grained and the other a coarsely crystalline porphyritic variety. The metarhyolite consists mainly of a uniformly fine-textured variety, but in places some large crystals of quartz and feldspar are present. The Cranberry granite, Blowing Rock gneiss, and metarhyolite give rise wholly or in part to the Ashe loam, Ashe stony loam, Porters clay loam, Porters stony loam, and to inextensive areas of other soils.

A line parallel to and about 1 mile south of the North Fork of New River extending from a point near where the river enters the county to Dresden, thence in a southeasterly direction nearly to Nathans Creek, and then back to Todd, marks roughly the boundary of a formation known as the Roan gneiss.¹ This formation consists of a series of beds of hornblende gneiss, hornblende schist, diorite, mica schist, and gneiss. The hornblende schist and diorite are dark greenish or black in color, while the micaceous beds are dark gray. The rocks of the Roan gneiss formation are hard, brittle, and very resistant to the agencies of weathering, and have given rise to many stony soil types. The soils derived from this formation, either wholly or in part, are the Chandler stony loam, Porters stony loam, Clifton stony loam, Talladega stony loam, Rock outcrop, Porters clay loam, and some areas of the Chandler loam and Talladega clay loam.

Within the Roan gneiss there are a number of rock areas belonging to a minor formation, the soapstone, which gives rise to areas of Porters clay loam, Chandler loam, and Talladega clay loam.

The southern and eastern portion of the county as far north as Weaversford is made up almost exclusively of a formation known as the Carolina gneiss.² This consists of mica gneiss and mica

¹ Loc. cit. Not all the area included in this boundary has been covered by a geological survey. The western portion of it is included in the Roan gneiss and apparently the same formation, with small areas of other formations included, reaches nearly to Nathan.

² Loc. cit. Not all of the southern and none of the eastern part of the area has had its geological formations mapped. A part of the southern end of the county is occupied by the Carolina gneiss, and it is believed that the entire southern and the eastern portion of the county as far north as Weaversford is covered by the same formation, with included inextensive areas of other formations.

schist with some granite, diorite, and other rock. The Chandler loam, the Talladega clay loam, and two small areas of Porters clay loam are derived from the rocks of the Carolina gneiss. Inextensive representatives of the Cranberry granite occur with the Carolina gneiss, giving rise to the Ashe loam, the Porters clay loam, and the Porters stony loam. The following brief descriptions show the main relationships existing between the several series of soils:

The Porters soils are characterized by the brown or reddish-brown to red color of the surface material, and by the red color and brittle or only moderately friable structure of the subsoil, which is usually a clay. The Talladega soils have about the same color characteristic as the Porters, the most important differences being the decidedly greasy feel of the Talladega material resulting from the presence of a large quantity of mica flakes.

The Ashe series is characterized by the brown or yellowish-brown color of the surface soils, and by the yellow color and moderately friable structure of the subsoil, which is generally a clay. The Chandler soils in color features practically coincide with those of the Ashe series. They differ from the latter in having a decidedly greasy feel, particularly in the subsoil, owing to a high content of mica flakes. The relation of the Chandler soils to the Ashe is practically the same as that of the Talladega to the Porters.

The Clifton soils have a brownish color in the surface portion and an ochreous-yellow to yellowish-brown color in the subsoil. Partially decomposed rock is frequently encountered within the 3-foot section. This series may be considered the Appalachian equivalent of the Montalto series of the Piedmont Plateau province.

The alluvial soil is represented by one type, the Toxaway loam, consisting of material deposited by overflow and repeated additions of soil material carried in suspension by the waters coming from the uplands. This is typically a brown to dark-brown loam, underlain by yellowish clay loam.

The following table gives the names and area of each of the soil types mapped in Ashe County:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Chandler loam.....	90,880	33.3	Porters stony loam.....	5,312	1.9
Ashe loam.....	69,696	25.5	Talladega stony loam.....	2,496	.9
Talladega clay loam.....	36,928	13.5	Rock outcrop.....	1,280	.5
Porters clay loam.....	31,104	11.4	Ashe stony loam.....	576	.2
Toxaway loam.....	15,360	5.6	Total.....	273,280
Clifton stony loam.....	11,136	4.1			
Chandler stony loam.....	8,512	3.1			

TOXAWAY LOAM.

In texture, structure, color, and depth the soil and subsoil of the Toxaway loam vary widely, even within small areas.

The typical Toxaway loam consists of about 8 to 10 inches of a medium-brown to dark-brown mellow loam, underlain by a yellowish to dark-brown heavy clay loam, which may continue to 3 feet or more, or may grade quickly into a brownish-yellow, micaceous loam, and sometimes below this into a grayish loam containing some fine sand. In places the soil is underlain at about 6 to 10 inches by a gray, fine, medium or coarse sand which passes abruptly into a black, usually wet and sticky, heavy clay loam or clay. The type includes patches of a black loam which properly belong to a series not established. These, along with occasional bodies of fine sand and fine sandy loam, were not mapped on account of their small size.

Beds of water-rounded gravel are frequently encountered in the 3-foot section. Again, it is not uncommon to find strata of varying material alternating with each other throughout the soil section.

The black soil referred to is a heavy black loam, underlain at about 10 to 12 inches by a black or bluish heavy clay containing sand and gravel. The sandy soils are generally confined to the banks of the larger streams and consist mainly of a dark brownish gray, mellow, micaceous fine sand, underlain at a depth of about 10 to 12 inches by a brown or greenish-brown material of nearly the same texture and structure as the surface soil. These areas would have been mapped as Toxaway fine sand had they been of sufficient size.

The Toxaway loam occupies the flood plains of the streams. The most important areas are developed along the North Fork and South Fork of New River and their tributaries.

The surface of the Toxaway loam is nearly level, although there is usually a gentle slope toward the stream and in the direction of flow, but none of the areas are sufficiently uneven in surface configuration to induce erosion. Along the North Fork and the South Fork of New River and along some of the larger creeks the slope toward the stream is frequently broken by narrow strips of fine sand developed as ridges or natural levees along the stream banks.

The Toxaway loam is a first-bottom soil subject to overflow and is poorly drained. A few inextensive second-bottom areas were included with the type and not mapped separately on account of their small size, and these, together with an occasional narrow strip of fine sand, are not subject to overflow. Frequently dwellings and barns have been built on some of the higher second-bottom areas, or where the second bottoms merge into the residual upland soils.

The Toxaway loam is alluvial in origin. The material is of varied mineralogical composition, representing the wash from a variety of

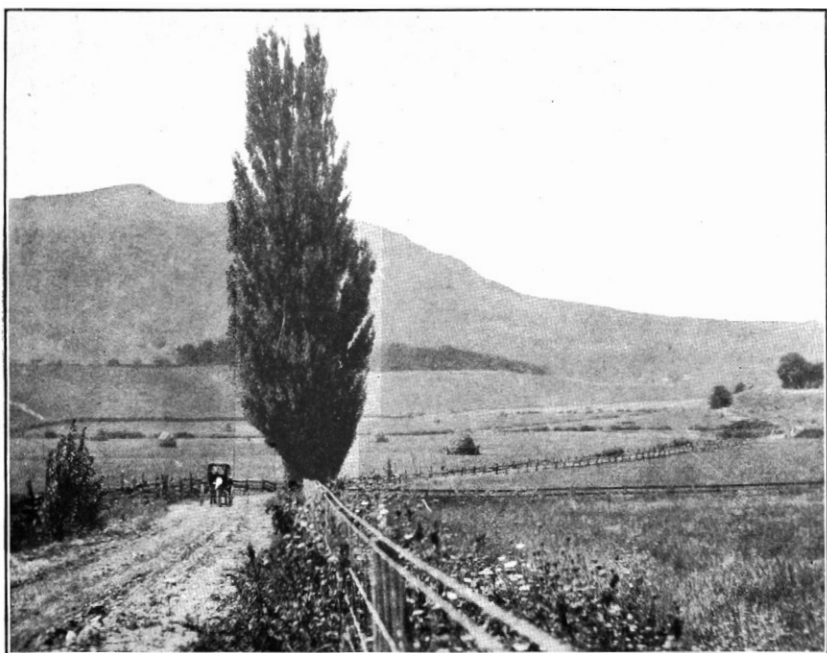


FIG. 1.—CHARACTERISTIC TOPOGRAPHY OF ASHE COUNTY.

[The prominence in the background is Nigger Mountain. The low-lying land in the foreground comprises some of the best farming land in the county.]

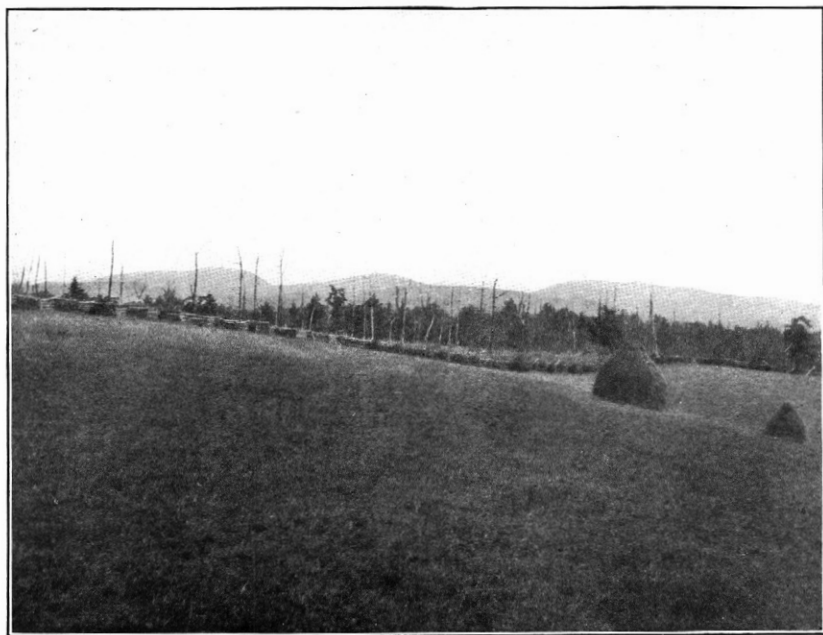


FIG. 2.—TOPOGRAPHY OF THE CREST OF THE BLUE RIDGE MOUNTAINS IN ASHE COUNTY.

[There is considerable smooth, cultivable land like this in the county.]

upland soils. The particles have been swept down by the surface drainage and deposited over the stream flood plains by overflow waters. As a result of frequent overflows, additional deposits are continually being laid down.

Scarcely any of the Toxaway loam remains uncleared. The original forest growth consisted principally of poplar, chestnut, chestnut oak, red oak, black walnut, white walnut, sycamore, locust, elm, and a variety of water-loving shrubs and vines.

The Toxaway loam is especially well suited to the production of hay and corn. Hay produces one-half ton to $2\frac{1}{2}$ tons per acre, averaging about $1\frac{3}{4}$ tons. Corn yields range from 20 to 100 bushels per acre, the average being about 40 bushels. The type is not especially well suited to the production of wheat, which is sowed only to form a necessary step in the crop rotations. Rye produces from 15 to 20 bushels.

For the permanent improvement of the Toxaway loam drainage is the prime essential. Over much of the type artificial drainage has already been at least partially established. Tile drainage would prove most satisfactory, but owing to the lack of transportation facilities, and in view of the fact that there are no tile manufactories near at hand, this is impracticable for the county as a whole. At present most of the drainage is through open ditches leading into the stream along which the soil occurs. The ditches should be at least $2\frac{1}{2}$ feet deep (3 feet deep is better in most instances). Blind ditches are also constructed by some farmers.

Turning under vegetable matter and liberal applications of barnyard manure will prove beneficial to the poorer or impoverished areas of the type. Lime will also be beneficial to many portions of the type, especially to those areas which have been recently cleared and drained. An acreage application of something like 1 ton of burnt lime or twice this quantity of ground limestone could be used safely.

As an individual soil type the Toxaway loam is more highly prized than any other soil of the county. It is valued at \$50 to \$200 an acre, according to location and state of improvement.

CLIFTON STONY LOAM.

The soil of the Clifton stony loam consists of a medium-brown to dark-brown or almost black loam or heavy loam about 6 to 10 inches deep. The subsoil is an ochreous-yellow to yellowish-brown clay loam or clay, having in places a faint greenish tinge, due to the presence of numerous partially weathered particles of a rock of this color, and in other places a faint reddish color. Partially decomposed rock is sometimes encountered within the 3-foot section.

The type includes a phase which consists of about 8 to 14 inches of a black, heavy loam or clay loam of high organic-matter content, underlain by a bluish-gray or black, crumbly clay, which in places extends to a depth of 3 feet and in others merges before reaching this depth into material like the subsoil of the typical development of the type.

Angular rock fragments of varying size are generally present on the surface and throughout the soil and subsoil in quantities sufficient to give the land the character of a stony loam. In the steeper situations rock ledges and cliffs are of frequent occurrence. There are included with the type a number of small areas in which the percentage of rock fragments is not great enough to interfere with cultivation. These comparatively stone-free spots form a large proportion of the type, probably 40 per cent of the deep phase, but they are too small to be mapped separately.

Of the stony types in Ashe County the Clifton stony loam is the most extensive. The largest body, comprising an area of about 10 square miles, occupies the northeastern half of Bluff Mountain, together with the greater part of Elk Ridge, extending south to Todd. The second largest area lies along the western side of Long Hope Creek and extends from the Peak Mountain due south to the Ashe-Watauga County boundary. A third area occupies the crests and intervening gaps of Three Top Mountain, extending from the extreme northeastern end of the mountain in a southwest direction nearly to Creston. An area of about 2 square miles is found on Nigger Mountain, and another of nearly the same size occupies the highest part of Phoenix Mountain. Inextensive areas occur in other parts of the county.

The typical Clifton stony loam occupies moderate and steep mountain slopes, and its drainage is good. The deep, black phase is found almost exclusively on the mountain crests and in the intervening gaps. Portions of the type constitute the most even-surfaced upland soil of the county. In a number of instances areas of 100 to 150 acres have a uniform, gently rolling to rolling surface throughout.

The Clifton stony loam is a residual soil owing its origin to the weathering of massive diorite, together with schistose and gneissoid rocks, all of which are included in the Roan gneiss formation.

The forest growth on this type consists largely of locust, chestnut, chestnut oak, white oak, red oak, sugar maple, beech, and buckeye, together with some spruce, white pine, poplar, and dogwood. On some areas there is a dense undergrowth of hazelnut, laurel, and rhododendron.

Only a small part of the typical soil is under cultivation. The principal crops are hay, corn, rye, and buckwheat. Corn produces 15

to 40 bushels per acre, hay one-fourth ton to 1½ tons, rye 15 to 25 bushels, and buckwheat 10 to 20 bushels.

The north and west slopes within the black phase are admirably adapted to the production of hay and rye. Corn on this land does not do well unless the season is unusually warm. Ordinarily, owing to the high elevation, the temperature is so low that the crops do not attain sufficient growth and the grain does not mature well. Liberal applications of phosphatic fertilizer will probably be beneficial in hastening the maturity of this crop.

The Clifton stony loam is valued at \$20 to \$50 an acre.

The following table shows the results of mechanical analyses of fine-earth samples of the soil and subsoil of the Clifton stony loam:

Mechanical analyses of Clifton stony loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
233009.....	Soil.....	2.5	5.7	5.4	24.6	23.7	23.4	14.2
233010.....	Subsoil.....	3.0	6.4	6.5	28.4	21.1	21.3	13.1

ASHE LOAM.

The Ashe loam consists of a yellowish-brown to brown, mellow loam, underlain at a depth of about 7 to 12 inches by a yellow or brownish-yellow to slightly reddish-yellow, moderately friable clay or clay loam which passes gradually into the disintegrated parent rock at a depth of 24 to 30 inches. In coves and other situations conducive to the accumulation of surface wash and vegetable matter, the soil sometimes reaches a depth of 18 inches and has a darker color than usual.

Throughout the type there are small areas of light-brown to brownish-red heavy soil with a light brownish red, friable clay subsoil. These areas belong more properly to the Porters clay loam type, and would have been mapped as such had they been of sufficient size to show on a map of the scale used in this survey. The type also includes patches, the surface soil of which carries sufficient fine sand to give the material a fine sandy loam texture. These too are not large enough to be shown separately on the map. Still another variation from the typical Ashe loam consists of small areas carrying a large percentage of granite and other rock fragments on the surface and throughout the 3-foot section. These areas, where of sufficient size, were mapped as Ashe stony loam. In a few places rock outcrops are encountered.

The Ashe loam occurs almost exclusively north of the North Fork of New River or near the river on the south side. In this section it

is the predominating soil, its continuity being broken only by areas of Porters clay loam and smaller areas of other types. The largest area of this type found at any considerable distance south of the North Fork of New River is that $1\frac{1}{2}$ miles east of Hopkins.

The type occupies steeply sloping mountain sides and steeply rolling to hilly intermountain areas. On the lower mountains there are small areas having a rather gently rolling surface. These constitute the smoothest areas of the type.

Some areas are too steep for utilization for other purposes than forestry, others are available for hand-hoed crops and fruit, while a large total area can be cultivated in the ordinary way.

As a result of the sloping surface configuration and the friable structure of the subsoil the type is well drained.

The Ashe loam is derived chiefly from granite, schist, and granitoid gneiss.¹ Included in the granite, schist, and granitoid gneiss are numerous dikes of diorite, hornblende schist, pegmatite, and schistose basalt. Near Creston a small portion of the Ashe loam is derived from a formation made up of two distinct varieties of gneiss, one with large porphyritic feldspar crystals, and the other uniformly fine grained.² The parent granite, schist, and gneiss are composed of quartz, orthoclase, and plagioclase feldspar, biotite, and muscovite mica, hornblende, magnetite, ilmenite, and epidote. These minerals have weathered down largely to a loam and clay loam.

The native forest growth on the Ashe loam consists principally of chestnut, chestnut oak, maple, beech, dogwood, white oak, and red oak, and near the streams, hemlock, laurel, and rhododendron.

The type is considered a fair soil for all crops common to this section except wheat. The best portions of the type are found near Maxwell, in the vicinity of Ashland, along Rich Hill Creek and on Horse Creek. Corn yields average 25 bushels per acre, although yields of 60 bushels have been obtained. An average of 1 ton of hay per acre is produced. Rye produces from 10 to 20 bushels, averaging 15 bushels, and buckwheat 10 to 40 bushels, averaging 20 bushels per acre. Irish potatoes and a number of vegetables such as cabbage, beets, and beans, do well. Sorghum is grown on small patches with satisfactory results. Apples and other fruits common to this section of the State give excellent yields.

¹ Loc. cit. The granite schists and granitoid gneiss from which the Ashe loam is derived belong to a formation, a portion of which, together with a larger area lying outside of Ashe County, has been called by Arthur Keith, of the United States Geological Survey, the Cranberry granite. According to Keith this formation is of Archean age. The geology of the remainder of the area in which Ashe loam is the predominating soil type has not been worked out, but there is no doubt that it is an extension of the same formation.

² These two varieties of gneiss make up a formation which, according to Arthur Keith of the United States Geological Survey, is the Blowing Rock gneiss and is of Archean age.

Commercial fertilizer is not generally used on the type. In some sections buckwheat is given an acreage application of 200 to 300 pounds of a 10-2-2 mixture or 14 per cent acid phosphate, with good results. Corn is rarely fertilized. Wheat is sometimes given a light application of a 10-2-2, 10-2, or 10-4 fertilizer mixture, and the results in most instances have been good. In many places this soil is deficient in humus. This can be remedied by plowing under vegetable matter such as rye. This can be sowed to good advantage in corn at the last cultivation. The rye should be turned under in the spring.

The Ashe loam is valued at \$20 to \$100 an acre, according to location and topography. It is considered somewhat less productive than the Cecil under similar conditions of topography. It is probably more productive, however, than the Chandler.

The following table shows the results of mechanical analyses of samples of the soil and subsoil of the Ashe loam:

Mechanical analyses of Ashe loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
233003.....	Soil.....	6.2	10.6	5.2	13.9	16.4	21.2	16.5
233004.....	Subsoil.....	8.0	9.6	4.8	12.9	15.1	35.0	14.6

ASHE STONY LOAM.

The soil of the Ashe stony loam to a depth of 6 to 10 inches consists of a yellowish-brown to brown, mellow loam. The subsoil is a yellow or yellowish-brown moderately friable clay which usually passes into disintegrated rock at a depth of 24 to 30 inches. In many places the subsoil stratum is entirely wanting, there being only a thin mantle of soil resting on the solid bedrock, and it is not infrequently the case that the entire soil covering has been removed from the rock. Angular rock fragments are scattered over the surface and disseminated throughout the soil and subsoil in quantities sufficient to give the land a decidedly stony character.

The Ashe stony loam is not extensively developed in the county. The largest body lies near the North Carolina-Tennessee State line on the eastern slope of Pine Mountain. Another area occurs near the State line about 1 mile southeast of Amber Gap. These, together with three small areas in the northwestern part of the county, comprise the entire extent of the soil. The type occupies steep mountain slopes. The soil material is derived from granite, schist, and granitoid gneiss. Erosion has kept closer pace with rock weathering than in case of the Ashe loam; consequently the average depth to the rock is considerably less.

The forest growth consists principally of chestnut, chestnut oak, hemlock, maple, red oak, white oak, locust, and dogwood.

Only a small part of the type has been cleared. It is used only for pasture. Much of the soil could be used for apple orchards and vineyards. The steeper and more stony portion is best suited to forestry and pasturage. The Ashe stony loam is valued at about \$20 an acre.

PORTERS STONY LOAM.

The surface soil of the Porters stony loam consists of a reddish-brown to red loam or clay loam. The subsoil, which begins at a depth of 6 to 10 inches, is red clay of stiff to only moderately friable structure. Disintegrated rock is frequently encountered at about 24 to 30 inches. The subsoil usually carries mica, though not enough to impart the greasy feel characteristic of the Talladega and Chandler soils. Fragments of rock are abundant over the surface, and are present to a somewhat less extent throughout the soil section. Large boulders outcrop in places and in the steeper situations rock ledges are of frequent occurrence.

The Porters stony loam occurs mainly in the southwestern section of the county. The areas vary in size from about 10 acres to 2 square miles. The largest of these lies on the northern slope of Three Top Mountain between the crest of the mountain and Clifton.

The greater part of the Porters stony loam occupies rough and rugged topographic positions and a considerable area can not be profitably cultivated. Some of the smoothest areas can be farmed with safety, the rock fragments serving to check erosion. On the gentle slopes near the foot of mountains there are small and, occasionally, rather large areas which are not too steep to be plowed. Much of the type can be cultivated with hoes where the surface is too steep for the use of plows.

The Porters stony loam is derived mainly from the more resistant varieties of hornblende gneiss, hornblende schist, and diorite of the Roan gneiss formation.¹ In color these rocks are dark gray to black, sometimes showing a greenish cast.

The forest growth on the Porters stony loam consists principally of chestnut, chestnut oak, red oak, white oak, sugar maple, locust maple, and poplar. In places there is a dense undergrowth of laurel and rhododendron.

The Porters stony loam is a strong soil, the smoother phases of which are well suited to the production of corn, hay, wheat, buckwheat, rye, and oats. The large quantity of rock fragments upon the surface tends to hold the soil in place and prevent surface washing.

¹ Loc. cit. These rocks have been described by Arthur Keith of the United States Geological Survey as being of igneous origin and belonging to the Archean age.

As a result of this the steepest slopes upon which teams can be handled are cultivated without causing damage from erosion. Crop yields on this type are practically the same as on the Porters clay loam. The steeper portions of the type can be used for pasture, apple and peach orchards, and forestry.

Where smooth enough to cultivate the type is held in about as high esteem as the Porters clay loam. None of it can be bought for less than \$20 an acre.

PORTERS CLAY LOAM.

The typical Porters clay loam consists of a reddish-brown or red, heavy, compact clay loam, underlain at a depth of about 7 to 10 inches by a red, moderately friable to fairly stiff clay, which in places passes into the disintegrated parent rock at a depth of about 30 inches. The soil to a depth of 2 or 3 inches is usually dark red or reddish brown in color, owing to the presence of organic matter.

Throughout the type there occur patches in which the surface soil is lighter colored and more nearly a loam in texture than the average. In some localities this variation is of quite common occurrence.

Another variation from the typical soil is represented by small areas carrying large quantities of rock fragments upon the surface and throughout the soil and subsoil. In some places these rock fragments consist for the most part of quartz, and their presence is due to the outcropping of quartz veins. These stony areas would have been mapped as Porters stony loam had they been large enough to be shown separately on the map.

In places the subsoil carries some mica, but not enough to impart the greasy feel characteristic of the Talladega and Chandler soils.

With the exception of three small areas, the Porters clay loam is confined to that section of the county lying north of the South Fork of New River. The areas south of the South Fork of New River are not altogether typical. The largest area of this type is the irregularly outlined body extending in a westerly direction from Grassy Creek Church to Helton, and thence in a northwesterly direction nearly to the Virginia State line. The second largest area, comprising about 4 square miles, lies northwest of the town of Nathans Creek. The town of Jefferson is located on a large area of this type which extends to a point about 1 mile north of the town and in a southwesterly direction nearly to Beaver Creek. Other areas of the type are found near Woodford, Baldwin, Sutherland School, Apple Grove, and west of Sturgills. The type has its most typical development in the area between Grassy Creek Church and Helton.

The Porters clay loam occupies moderate and steeply rolling mountain slopes, rolling and hilly intermountain areas, and, frequently,

the crests of peaks and ridges of intermediate elevation. It is never found on the crest of the highest peaks. The areas near Jefferson, Nathans Creek, and Grassy Creek Church represent the smoother portions of the type. The soil has good surface drainage and under-drainage.

Not all the area in which Porters clay loam occurs has had its geology worked out. The southwestern part of the county has been covered by a geological survey, according to which there are not less than four geological formations present, giving rise to the Porters clay loam. These formations are the Roan gneiss, Cranberry granite, Blowing Rock gneiss, and Soapstone, all of which are of igneous origin and belong to the Archean age.¹ The Roan gneiss is made up principally of hornblende gneiss and diorite, while the Cranberry granite is composed mainly of granite, schist, and granitoid gneiss. The Blowing Rock gneiss formation consists of two varieties of gneiss, one a dark, coarse porphyritic, and the other a fine-grained rock. The soapstone formation consists of peridotite and pyroxenite.

The native forest growth on the Porters clay loam consists of chestnut, white oak, red oak, chestnut oak, poplar, maple, sugar maple, dogwood, and some ash, together with an undergrowth of laurel, rhododendron, and various other shrubs.

This is the most productive upland soil of the area. It is well adapted to the grass crops, corn, wheat, buckwheat, rye, oats, and sorghum. Hay produces from one-half ton to $2\frac{1}{2}$ tons per acre, averaging about $1\frac{3}{4}$ tons. Corn yields range from 20 to 100 bushels per acre, the average being about 35 bushels. Wheat yields vary from 10 to 30 bushels per acre, averaging 15 bushels. Buckwheat ranges from 12 to 40 bushels per acre, averaging about 20 bushels. Irish potatoes and garden vegetables do especially well. This is one of the best cabbage soils of western North Carolina. Apples and Catawba and Concord grapes are successfully produced.

Commercial fertilizers are not generally used. Corn is rarely fertilized. Wheat and buckwheat are sometimes given a light application of a 10-2-2 or 10-2 mixture. It is believed that phosphoric acid alone will give equally as good results as a complete fertilizer.

The Porters clay loam is inherently a strong soil and may easily be made highly productive. The cheapest and most effective means of accomplishing this is through the use of barnyard manure, turning under leguminous crops, practicing crop rotations, especially those including the legumes, and deep breaking. Deep plowing will not only increase the depth of the soil, but will also help to

¹ Loc. cit. A fifth formation, the Carolina gneiss, gives rise to a few areas of the type, but the soil in these is not typical.

prevent washing. Liming will prove beneficial both in correcting acidity and in improving the structure of the soil.

The value of the Porters clay loam depends to some extent on its location and topography. Along the main roads and near the post-office villages it sells for \$75 to \$100 an acre. None of the type can be bought for less than \$50 an acre.

The following table shows the results of mechanical analyses of samples of the soil and subsoil of the Porters clay loam:

Mechanical analyses of Porters clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
233001.....	Soil.....	3.2	6.3	3.4	7.1	10.9	49.2	19.9
233002.....	Subsoil.....	3.5	6.0	3.4	5.5	9.4	46.8	25.2

TALLADEGA STONY LOAM.

The soil of the Talladega stony loam consists of about 6 to 18 inches of a brownish-red to red, mellow loam or clay loam. The subsoil is a red, moderately friable clay loam or clay having a greasy feel due to the presence of a high percentage of fine mica flakes. The soil to a depth of 2 or 3 inches, on some of the less steep, forested slopes, is dark brownish red to nearly black owing to the accumulation and decomposition of vegetable matter. The deepest parts of the type occur in coves and in depressions on mountain sides. Angular rock fragments are present on the surface and throughout the soil section and frequently constitute 25 to 50 per cent of the soil mass. On the steeper situations there are outcropping boulders and rock ledges. Some small areas have been cleared of the rock fragments and put under cultivation.

The Talladega stony loam does not embrace a very large total area. Like the Chandler stony loam it occurs on the highest mountains. The largest area lies on the eastern slope of Nigger Mountain. A narrow strip $2\frac{1}{2}$ miles long and less than one-half mile wide extends along the eastern side of Long Hope Creek. Small areas occur on the eastern slopes of Elk Ridge near Toliver and between Trout and Creston.

The Talladega stony loam mainly occupies steeply broken and precipitous mountain slopes, although there are some fair-sized areas with comparatively smooth surfaces. In the development on the eastern slope of Nigger Mountain there are many of these small smoother areas.

The type is derived from micaceous schist and schistose and gneissoid rocks of the Roan gneiss formation. These rocks vary in color from light gray to dark gray or nearly black. Most of the type seems to have been derived from the darker colored varieties.

The native forest growth on the Talladega stony loam consists of chestnut, oak, hickory, sugar maple, and cucumber. In places there is an undergrowth of laurel, rhododendron, and various other shrubs.

A large part of this type is too steep and rocky for cultivation. This rougher portion is used mainly for pasture and forestry. The type as a whole is well suited to apples and peaches, which are grown profitably. Besides fruit, corn, hay, wheat, rye, oats, Irish potatoes, and garden vegetables are grown. The yields are practically similar to those on the Talladega clay loam, and the soil will respond to such methods of treatment and improvement as have been suggested for that type. Cultivation, however, is more difficult, owing to the presence of rock fragments and to the steeper slope.

This land is valued at about \$20 to \$75 an acre, according to its topography and content of rock fragments.

TALLADEGA CLAY LOAM.

The typical Talladega clay loam consists of about 6 to 10 inches of a brownish-red to red loam or clay loam, underlain by a red, moderately friable or brittle clay having a decidedly greasy feel, due to the presence of mica particles. The subsoil frequently grades into disintegrated rock at about 30 inches. In coves and near the foot of many of the gentler slopes the depth of the surface soil is often considerably greater than 10 inches, frequently reaching a depth of 18 inches, and the color is a dark brownish red, owing to the accumulation of vegetable matter. Throughout the type there are occasional small areas whose surfaces carry large quantities of rock fragments varying in size from small stones to large boulders. Had these areas been of sufficient size they would have been mapped as Talladega stony loam.

The Talladega clay loam occurs mainly south of the North Fork of New River. Only a few areas of any importance are found north of this stream. The largest of these are the areas 1 mile northwest of Clifton, in the vicinity of Comet, and southwest of Helton. This type comprises about one-third of the total area of the southeastern quarter of the county. The soil is most typically developed along the county line south of Idlewild, near Nettleknob, and around Beaver Creek.

The Talladega clay loam occupies moderate to steep slopes extending from the banks of the streams or the outside margin of stream

bottoms up to the mountain crests. It is not often, however, that the soil occurs on the crests of the highest peaks. On top of the intermediate peaks and ridges there are considerable areas whose surfaces are comparatively smooth, but frequently on the mountain slopes the type is too steep for cultivation with plows. Such areas are cultivated with hand implements.

The type has good surface drainage and underdrainage. When properly handled the gentler slopes do not suffer badly from erosion.

The Talladega clay loam is a residual soil which has been derived from the rocks of two distinct geological formations, the Roan gneiss and Carolina gneiss. The Roan gneiss formation includes hornblende gneiss, hornblende schist, and diorite, together with some mica schist and gneiss. In color these rocks range from dark gray to dark greenish or black. They are composed of quartz, muscovite, a little biotite, and more or less feldspar. The Carolina gneiss consists of a series of interbedded mica schist, mica gneiss, and fine-grained granitoid rocks. Usually these are of a somewhat lighter color than the rocks of the Roan gneiss formation. When weathered they usually have a dull-gray color. The mica schists of this formation are composed chiefly of quartz, muscovite, biotite, and feldspar. The fine-grained granitoid rocks contain quartz and feldspar, with a little muscovite and biotite mica. The granitoid rocks and the schists are interbedded, and areas of Talladega clay loam derived from each of these are exactly similar. Generally the soil derived from the Roan gneiss is somewhat heavier and more productive than that derived from the Carolina gneiss. In a few places where the soil has not been properly cultivated surface washing has given rise to small "gall spots."

The native forest growth consists for the most part of chestnut, chestnut oak, white oak, red oak, maple, poplar, and dogwood, together with a scattering growth of white pine, hemlock, linden, and cucumber.

The Talladega clay loam is considered a good soil, but it is not quite so productive as the Porters clay loam. It is well suited to corn, wheat, buckwheat, rye, oats, and grass crops, such as clover, timothy, herds grass, and orchard grass. It is also well suited to all fruits and garden vegetables common to this section. Apples do especially well. Corn yields range from 25 to 60 bushels, the average being about 40 bushels per acre, and wheat produces 10 to 25 bushels per acre, averaging 15 bushels. The yields of oats on this type range from 30 to 40 bushels per acre, and of buckwheat from 15 to 30 bushels. The type is extensively used for grazing.

The systematic rotation of crops is not generally practiced, and commercial fertilizers are used only in a few instances. The Talladega clay loam is valued at \$20 to \$100 an acre.

The following table shows the average results of mechanical analyses of samples of the soil and subsoil of the Talladega clay loam:

Mechanical analyses of Talladega clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
233015, 233017.....	Soil.....	2.0	4.4	3.9	17.3	13.8	31.9	26.3
233016, 233018.....	Subsoil.....	2.6	3.7	3.9	21.1	13.6	32.3	22.7

CHANDLER STONY LOAM.

The soil of the Chandler stony loam, to a depth of about 8 to 12 inches, consists of a brown to yellowish-brown, mellow loam. The subsoil is a yellow or brownish-yellow moderately friable clay loam, having a greasy feel as a result of the presence of mica flakes. In forested areas the soil to a depth of 2 or 3 inches is usually dark gray to black in color, owing to the presence of a large quantity of organic matter. In some instances the subsoil is a decidedly light grayish yellow loam of rather open structure. Large quantities of rock fragments are scattered over the surface and disseminated throughout the soil and subsoil to a depth of 24 to 30 inches, where the disintegrated parent rock is encountered. These fragments tend to hold the soil in place, so that steep slopes may be cultivated with plows without danger of erosion.

The Chandler stony loam occurs on the highest mountains. The largest area is of very irregular outline, extending from near Toliver on the western slope of Bluff Mountain to the southeastern end of Three Top Mountain. Narrow strips extend from the southern slopes of Three Top Mountain across to the northeastern end of the Bluff Mountain, and another reaches in a southwest direction nearly to the county line. Smaller areas occupy the east and west slopes of Elk Ridge, the northern end of Paddy, the northern slope of Three Top and the northern and southern slopes of Phoenix Mountains. Three small areas occur in the northern part of the county near Apple Grove Church.

The Chandler stony loam occupies gently rolling and steep mountain sides, and strips of the type reach from the banks of streams nearly to the mountain crests. The greater part of the type is too stony and steep for cultivation to general farm crops.

The Chandler stony loam is a residual soil and owes its origin to the weathering of the rocks of the Roan gneiss formation. This formation is composed chiefly of hornblende gneiss, hornblende schist, and diorite, interbedded with mica schist and gneiss. Those portions of the formation giving rise to the Chandler stony loam are inter-

bedded at frequent intervals with the mica schist and gneiss, and in places it appears that these materials form the greater part of the rock mass.

The virgin forest growth on the Chandler stony loam consists mainly of chestnut, a variety of oaks, sugar maple, and soft maple, together with some poplar, hickory, white pine, dogwood, and spruce pine. Over small areas there is a dense undergrowth of hazelnut, laurel, and rhododendron.

Only a small part of the Chandler stony loam is under cultivation. The type is used for practically the same crops as the Chandler loam, and the yields are about the same. It will respond to the methods of treatment and improvement suggested for the Chandler loam. The steeper phases of the type can be used for pasture and forestry. This soil is valued at \$20 to \$60 an acre.

CHANDLER LOAM.

The soil of the Chandler loam consists of a brown to yellowish-brown, mellow loam, varying in depth from about 8 to 14 inches. The subsoil is a brownish-yellow or slightly reddish yellow, friable or crumbly loam to clay loam, having a decidedly greasy feel, due to the presence of a high percentage of finely divided mica.

Along the margins between the Chandler loam and the other types the soil varies from the typical through a gradational phase, finally passing into the contiguous soil type. Throughout the type there occur spots consisting of a reddish-brown clay loam, underlain at a depth of about 8 to 12 inches by a red moderately friable loam or clay loam. These areas really belong with the Talladega clay loam and would have been mapped as such had they been of sufficient size. The deepest phases of this type are found in coves or on south-facing and east-facing slopes. In these situations the soil sometimes reaches a depth of 18 inches, and the surface 6 or 8 inches is usually dark gray to black in color, owing to a high content of organic matter. In places the depth of the surface soil has been considerably increased by accumulations of colluvial material, while in other places the normal depth has been decreased by erosion. Some small areas have had the entire surface soil washed off, thus giving rise to "gall spots."

The Chandler loam is the most extensively developed soil in the southeastern half of the county. The section of its dominant occurrence is roughly separated from the remainder of the area by a line drawn from a point on the county boundary near Todd in a northeasterly direction past Orion to Nathans Creek, thence northwesterly to Berlin, and thence northeasterly to the confluence of the North Fork and the South Fork of New River. There are also a good many areas north of this line, some of which comprise as much as 1 to 3 square miles.

The surface configuration of the Chandler loam is varied, though no large areas with level or even gently rolling surfaces are encountered. The type as a whole seems originally to have occupied an elevated plateau, which has become badly dissected by erosion, leaving interstream areas of rounded and precipitous hills. The crests of these probably represent the most even surfaces of the type. The slopes of these hills are frequently too steep for cultivation with stock, and only hand implements can be used. Some areas are fairly smooth.

The type has good drainage. The run-off from the steeper slopes results in ruinous erosion over cleared fields.

The material of the Chandler loam is derived from the rocks of the Carolina gneiss formation.¹ These rocks consist chiefly of mica gneiss, granite and mica schist, with some gneiss, granite, and diorite. North of the North Fork of New River the rocks of the Roan gneiss formation enter to some extent into the composition of the soil.

The native vegetation consists of chestnut, red oak, white oak, chestnut oak, and white pine, with some hickory and dogwood and a few lindens.

Of the cultivated soils of the area the Chandler loam is probably the least productive. However, nearly all crops common to this section of North Carolina are grown to some extent on this type. The most unproductive areas are those in the southern and eastern sections of the county. Corn yields range from 5 to 50 bushels, according to slope, depth of soil, and treatment, the average being about 15 bushels per acre. Buckwheat is rarely planted on this type unless it is to be followed by grass; the yields range from 10 to 20 bushels per acre, averaging about 12 bushels. Hay yields on this type are light. As a general rule only the south and east facing slopes are used for wheat and corn. Wheat is not generally fertilized. The yields range from 5 to 10 bushels, averaging about 8 bushels per acre. As in the case with the other soils of the county, the northern and northwestern slopes, locally styled "north land" and "northwest land," are considered best for grass and rye crops. On the type as a whole the yields of rye range from about 8 to 12 bushels, averaging about 10 bushels per acre. Oats produce 10 to 20 bushels, the average being about 15 bushels per acre. The Chandler loam is well suited to the production of apples, peaches, and such varieties of grapes as are common to this section of the State.

As a general rule this soil is very deficient in humus, a condition which can be corrected, or at least improved, by turning under manure and vegetation. Clovers are the principal leguminous crops common to this section, though they do not generally give good results

¹ Loc. cit. The origin of these rocks is unknown. According to Arthur Keith, of the United States Geological Survey, they are of Archean age.

on this particular soil. Such crops as rye, oats, and cowpeas could be used advantageously to replenish the organic supply of the soil by being plowed under in either the green or matured stage. If the soil is planted to corn, rye can be sown at the last cultivation and turned under green in the spring. An application of about a ton of burnt lime or 2 tons of ground limestone per acre would undoubtedly benefit the land.

The depth of breaking should be gradually increased and a systematic rotation of crops inaugurated. Corn followed by wheat, with grass the third year, and the grass left for three years, will prove a fairly good rotation, but the best scheme of crop succession will include an occasional legume. Tall meadow oat grass is one of the most satisfactory hay crops. Applications of barnyard manure will be especially beneficial to all crops.

When the type has been built up to some extent by these methods it is believed that clover crops can be grown and the productiveness of the soil in this way still further increased. The Chandler loam can be bought for \$20 to \$60 an acre.

ROCK OUTCROP.

Rock outcrop is a classification which includes small bodies of bare rock and thick beds of rock talus. Practically no soil is present, and no agricultural use, therefore, can be made of the areas shown under this heading.

Areas of Rock outcrop are found on the Peak, Nigger, Bluff, Paddy, Phoenix, Three Top, and Elk Ridge Mountains. They occupy the margins of the crests and the most precipitous slopes. Owing to the topographic position of these areas, erosion has kept pace with rock weathering, not allowing any accumulation of the products of decay, except for occasional patches of a thin mantle of soil, usually consisting of a dark-gray to black loamy material.

In the rock crevices and over the talus accumulations there is usually a scrubby growth of chestnut and oak. None of the timber is merchantable.

SUMMARY.

Ashe County, with an area of 427 square miles, or 273,280 acres, is situated in the extreme northwestern corner of North Carolina.

The county occupies a part of the Appalachian Plateau, and its surface features are mountainous. The smoothest upland areas of the county occupy the crests of the largest mountains. The only areas having gently sloping surfaces lie along the stream courses.

The North Fork and the South Fork of New River constitute the main streams of two distinct drainage basins which traverse the county from southwest to northeast and merge at the extreme northeastern corner of the county.

The population of the county is given in the 1910 census as 19,074. Jefferson, the county seat and only incorporated town, is situated nearly in the center of the county. There are no railroads in the county, and no stations within 28 miles of Jefferson. The nearest railroad points are Troutdale, Va., Mountain City, Tenn., and North Wilkesboro, N. C. There are a number of country store and post-office villages throughout the county.

The climate of Ashe County is healthful. There is an abundant rainfall, evenly distributed throughout the year. On account of the high elevation the growing season is rather short.

Stock raising is the chief agricultural pursuit of the county. Grass and grain are the leading crops.

The soils of Ashe County are derived mainly from the rocks of three geological formations—the Cranberry granite, the Roan gneiss, and the Carolina gneiss—but there are included inextensive areas of other formations. The Cranberry granite gives rise to the greater part of the Ashe loam and the Ashe stony loam. The stony types are derived mainly from the Roan gneiss. The Talladega clay loam and Chandler loam, together with smaller areas of other types, are derived from the Carolina gneiss. There is but one alluvial type in the county, the Toxaway loam. Exclusive of Rock outcrop, 6 series, including 10 soil types, are represented.

The Toxaway loam forms the most desirable land in the county. For grass and corn it is better than any of the other soils.

The Clifton stony loam generally occupies the crests of the highest mountains, where it is not well suited to corn and wheat, but is well adapted to the production of rye and grass.

The Ashe loam is not especially well suited to wheat. Some areas of the type are relatively unproductive for most crops. The greater part of the type is well adapted to the production of the clovers and fair yields of corn, rye, and buckwheat are obtained. The Ashe stony loam is not extensively developed and is comparatively unimportant.

The Porters clay loam, where not too steep, and the Porters stony loam are the best upland soils of the county. They are especially suited to the clovers, hay, corn, rye, oats, and buckwheat.

The Talladega clay loam and the smoothest portions of the Talladega stony loam are productive soils, well suited to corn, wheat, rye, oats, and buckwheat.

The Chandler loam produces comparatively light crop yields, but is susceptible of improvement. The Chandler stony loam gives practically the same crop yields as the loam and is responsive to the same methods of treatment.

Rock outcrop has no agricultural value.

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